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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/691,944	10/23/2003	Lowell D. Bok	4865-153	6320

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EXAMINER	
SMITH, FRANCIS P	
ART UNIT	PAPER NUMBER
1792	
MAIL DATE	DELIVERY MODE
02/03/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/691,944	BOK ET AL.	
	Examiner	Art Unit	
	Francis P. Smith	1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 October 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-11,13-23,25-29 and 42-47* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-11,13-23,25-29 and 42-47* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09 December 2008* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicants' arguments as per the amended claims filed 12/9/2008 have been fully considered but they are not persuasive.

Applicants submission of corrected figures 1 and 13 is acknowledged. The drawing objections are withdrawn. Claims 1, 11, 23 and 45 are amended and claim 47 is new. Claims 2, 12, and 24 have been canceled. Claims 1, 3-11, 13-23, 25-29, and 42-47 are currently pending and examined on the merits.

Regarding applicants' arguments that Froberg teaches away from placing a porous material in to a module prior to densification, applicants' attention is drawn to col. 6, lines 48-59 of Golecki whereby a porous material is loaded into a graphite cylindrical susceptor (e.g. module) for subsequent densification purposes. Furthermore, Golecki teaches that such densification methods may be conducted in a one step (e.g. batch) process or may also made into a continuous process by straightforward extensions of the batch system. Therefore, since Golecki teaches that both batch and continuous densification processes were known in the art at the time of the invention AND easily inter-changeable, Applicants' argument that Froberg teaches away from placing porous sheets into a module prior to densification is apparently without clear merit. Furthermore, it has been held that a claimed continuous operation would have been obvious in light of the batch process of the prior art. *Consult In re Dilnot, 319 F.2d 188, 138 USPQ 248 (CCPA 1963).*

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 45 and 47 are rejected under 35 U.S.C. 102(b) as being anticipated by Purdy et al. (US 2001/0019752 A1).

As per claims 45 and 47, Purdy teaches high temperature compositions made by the chemical vapor infiltration and deposition of a matrix within a porous structure. Specifically, Purdy teaches:

placing porous material into a module/loading the module into a CVI processing chamber [0062];

preheating a reactant gas (i.e. via pre-heater 458 of fig. 15)/introducing said reactant gas into said CVI chamber while heating a porous material in said module with a heater plate proximate said porous material, whereby said porous material in said module is densified [0062], [0068], and [0082].

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

> the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

6. Claims 1, 3-11, 13-20, 22, 23, 25-29, and 42-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Froberg (3,944,686) in view of Purdy et al. (2001/0019752) and Golecki et al. (US 5,348,774) as evidence.

Regarding claims 1, 4-6, 11, 14-16, and 23, Froberg teaches a method for vapor depositing pyrolytic carbon on porous sheets of carbon material. Specifically, an elongated continuous porous sheet of fibrous carbon (i.e. porous material) is longitudinally traversed through a reduced pressure heating zone (i.e. loading the porous material into a CVI chamber) while introducing a reactant gas onto the heated porous sheet (i.e. densification/infiltration) (see abstract; col. 2, line 65-68). The sheet moved through guide slot 38 with polycrystalline graphite plates 36 and 40 located above and below the guide slot, whereby the plates are capable of acting as an electrical resistance element for heating slot 38 (see fig. 1; col. 4, lines 1-10).

Regarding the limitation of placing said porous material into a module, Froberg teaches the porous sheet is divided into a number of separate sheets by cutter 46 (see fig. 1; col. 3, lines 35-40). Once the porous material is cut into pieces, it would have been obvious to one skilled in the art at the time of the invention to place the pieces of porous sheets into a module or container in order to store or ship the densified porous material without damage or loss of said sheets. Additionally, it is very well known in the

CVI art to place porous material into modules for densification processes (for example, see [0090], [0092], and figs. 17 and 18 of Purdy as evidence). Regarding applicants' arguments that Froberg teaches away from placing a porous material in to a module prior to densification, applicants' attention is drawn to col. 6, lines 48-59 of Golecki whereby a porous material is loaded into a graphite cylindrical susceptor (e.g. module) for subsequent densification purposes. Furthermore, Golecki teaches that such densification methods may be conducted in a one step (e.g. batch) process or may also made into a continuous process by straightforward extensions of the batch system. Therefore, since Golecki teaches that both batch and continuous densification processes were known in the art at the time of the invention AND easily inter-changeable, Applicants' argument that Froberg teaches away from placing porous sheets into a module prior to densification is apparently without clear merit.

Claims 3 and 13, Froberg teaches removing the porous structures from the chamber after a heat treatment, which will inherently cool the porous material.

As per claims 7, 17, and 25, Froberg does not explicitly disclose a reverse gas flow process; however, once the reactant gas is introduced into the chamber, the gas will interact with the heating plates and will inherently have the same effect as the reverse flow rate of the second pre-heater of the instant application (col. 4, lines 1-10).

For claims 8, 9, 18, 19, 42, 43, Froberg discloses a reactant gas mixture comprising acetylene, natural gas, methane, etc (col. 3, lines 17-26), whereby natural gas inherently contains propane.

Regarding claim 22, Froberg teaches processing pressures within the range of

50-760 torr (col. 3, lines 9-16).

For claims 10 and 20, Froberg discloses a reactant gas mixture comprising acetylene, natural gas, methane, etc (col. 3, lines 17-26). Natural gas is a mixture of gaseous hydrocarbons with methane as the chief component while the balance is composed of varying amounts of ethane, propane, butane, and other hydrocarbon compounds. Therefore, propane is necessarily present in the mixture. Choosing specific percentages of methane and propane as per claims 10 and 20 would have been within the level of ordinary skill in the art at the time of the invention.

As per claim 26, Froberg teaches a method for vapor depositing pyrolytic carbon on porous sheets of carbon material. Specifically, an elongated continuous porous sheet of fibrous carbon (i.e. porous material) is longitudinally traversed through a reduced pressure heating zone (i.e. loading the porous material into a CVI chamber) while introducing a reactant gas onto the heated sheet (see abstract). The sheet moved through guide slot 38 with polycrystalline graphite plates 36 and 40 located above and below the guide slot, whereby the plates are capable of acting as an electrical resistance element for heating slot 38 (see fig. 1; col. 4, lines 1-10). Froberg does not expressly teach placing the material into a module or loading the module into said CVI chamber. However, Froberg teaches cutting sheets upon infiltration with pyrolytic carbon. Once the porous material is cut into pieces, it would have been obvious to one skilled in the art at the time of the invention to place the pieces of porous sheets into a module or container in order to store or ship the densified porous material without damage or loss of said sheets. It would be also obvious to cut porous sheets to the

required size prior to processing in order to eliminate leftovers of processed material and then place cut material in the module before loading into the deposition chamber in order to prevent cut material from dispersing throughout said chamber during infiltration with pyrolytic carbon, since selection of any order of performing steps is prima facie obvious in the absence of a new and unexpected results (Consult In re Burnhans, 154F.2d690, 69 USPQ 330 (CCPA 1946)). Additionally, it is very well known in the CVI art to place porous material into modules for densification processes (for example, see [0090], [0092], and figs. 17 and 18 of Purdy as evidence).

For claims 27 and 28, Froberg teaches heater plates above and below said module/porous material (col. 4, lines 1-10).

For claim 29, Froberg does not explicitly disclose a reverse gas flow process. However, once the reactant gas is introduced into the chamber, the gas will interact with the heating plates and have the same effect as the "reverse flow rate" of the instant application (col. 4, lines 1-10).

As per claim 44, Froberg teaches a sheet is moved through guide slot 38 with polycrystalline graphite plates 36 and 40 located above and below the guide slot, whereby the plates are capable of acting as an electrical resistance element for heating slot 38 (see fig. 1; col. 4, lines 1-10). Froberg does not expressly disclose the dimensions for the heat plates; however, it would have been within the level of ordinary skill in the art at the time of the invention to optimize the shape of the heater plates in order to minimize the cooling effect of the incoming gas and to provide uniform heating

of the substrate with the reasonable expectation of success.

7. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Froberg (3,944,686) and Purdy et al. (2001/0019752) and Golecki et al. (US 5,348,774) as applied to claim 11 above, in view of Sekiya et al. (JP 408002976A).

As per claim 21, Froberg does not expressly teach a temperature in the range of 1700-2500°F.

Sekiya teaches a method for producing a carbon fiber/carbon based matrix composite material prepared from carbon fibers according to a chemical vapor infiltration method (CVI method) whereby the temperature is regulated at 1200-1300°C, which is within the claimed range (see abstract). Therefore, one having ordinary skill in the art at the time of the invention would have utilized the temperature range as taught by Sekiya in Froberg's CVI method in order to densify a porous material at lower temperatures, thus saving energy and decreasing the cost of processing in Froberg's method with the reasonable expectation of success.

8. Claim 46 is rejected under 35 U.S.C. 103(a) as being unpatentable over Purdy et al. (US 2001/0019752 A1) in view of Fisher et al. (US 6,083,560).

Purdy does not expressly state that the heater plate has varying thicknesses. However, it is well known in the art to optimize the temperature in CVI processes in order to obtain the desired deposition rate (see Fisher at col. 14, lines 20-28). Therefore, it would have been obvious to one skilled in the art at the time of the

invention to vary the thickness/size of the heater plates in order to attain the optimum temperature for a desired deposition rate.

Conclusion

9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Francis P. Smith whose telephone number is (571) 270-3717. The examiner can normally be reached on Monday through Thursday 7:00 AM-5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mikhail Kornakov can be reached on (571) 272-1303. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/F. P. S./
Examiner, Art Unit 1792
/Michael Kornakov/
Supervisory Patent Examiner, Art Unit 1792